

WHAT IS CLAIMED IS:

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1. Control apparatus for providing fluid and power to an ultrasonic phacoemulsification handpiece during ocular surgery on an eye, said control apparatus comprising:

10 means for providing irrigation fluid to the handpiece;

means for aspirating fluid from the eye;

means for monitoring energy provided to the handpiece;

15 means for monitoring energy removed from the eye by aspirating fluid, including means for measuring a flow rate of the aspirated fluid and means for measuring a temperature difference between the irrigation fluid and the aspirated fluid; and

20 computer means, responsive to input from the means for monitoring energy provided to the handpiece and the means for monitoring energy removal from the eye for determining a matrix of power levels and duty cycle combinations that will not generate sufficient heat to create damage of eye tissue.

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2. The control apparatus according to claim 1 wherein said computer means further comprises means for preventing operation of the handpiece at power levels and duty cycle combinations outside of the determined matrix.

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3. In a control console for providing irrigation fluid and energy to an ultrasonic phacoemulsification handpiece and aspirating fluid from an eye during ocular surgery, control apparatus for regulating fluid flow and power, said control
35 apparatus comprising:

means for monitoring energy provided to the handpiece by the control console;

means for monitoring energy removed from the eye by aspirated fluid, including means for measuring a flow rate of the aspirated fluid and means for measuring a temperature difference between the irrigation fluid and the aspirated fluid; and

computer means, responsive to input from the means for monitoring energy provided to the handpiece and the means for monitoring energy removal from the eye for determining a matrix of power levels and duty cycle combinations that will not generate sufficient heat to create damage of eye tissue.

4. The control apparatus according to claim 3 wherein said computer means further comprises means for preventing operation of the handpiece at power levels and duty cycle combinations outside of the determined matrix.

5. A method for regulating fluid flow and energy in a control console for providing irrigation fluid and energy to an ultrasonic phacoemulsification handpiece and aspirating fluid from an eye during ocular surgery, the method comprising the steps of:

monitoring energy provided to the handpiece;
monitoring energy removed from the eye by aspirated fluid including measuring a flow rate of aspiration fluid and measuring a temperature difference between the irrigation fluid and the aspiration fluid; and

calculating, in response to input from the steps of monitoring energy provided and energy removed, a matrix of power levels and duty cycle combinations that will not generate sufficient heat to create damage of eye tissue.

6. The method according to claim 5 further comprises the step of preventing operation of the handpiece at power

levels and duty cycle combinations outside of the calculated matrix.

7. A method for regulating fluid flow and energy in a control console for providing irrigation fluid and energy to an cataract extraction handpiece and aspirating fluid from an eye during ocular surgery, the method comprising the steps of:

10 monitoring energy provided to a test handpiece;
monitoring energy removed from the eye by fluid aspirated by the test handpiece including measuring a flow rate of aspiration fluid and measuring a temperature difference between the irrigation fluid and the aspiration fluid using the test handpiece;

15 calculating, in response to input from the steps of monitoring energy provided and energy removed by the test handpiece, a matrix of power levels and duty cycle combinations that will not generate sufficient heat to create damage in eye tissue;

20 using the matrix in subsequent handpiece systems to prevent operation of the subsequent handpiece systems outside the matrix of power levels and duty cycle.

25 8. A method of regulating fluid flow and energy in a control console for providing irrigation fluid and energy to an ultrasonic phacoemulsification handpiece and aspirating fluid from an eye during ocular surgery, the method comprising the steps of:

30 monitoring energy provided to a test handpiece;
monitoring energy removed from the eye by fluid aspirated by the test handpiece including measuring a flow rate of aspiration fluid and measuring a temperature difference between the irrigation fluid and the aspiration fluid using the test handpiece;

35 calculating, in response to input from the steps of monitoring energy provided and energy removed by the test

handpiece, a matrix of power levels and duty cycle combination that will not generate sufficient heat to create damage in eye tissue;

5 using the matrix in order to alert a user of subsequent handpiece systems of selected power levels and duty cycle that would cause damage of eye tissue.

9. A method for regulating fluid flow and energy in a control console for providing irrigation fluid and energy to
10 an ultrasonic phacoemulsification handpiece and aspirating fluid from an. eye during ocular surgery, the method comprising the steps using a test handpiece to determine a matrix of power levels and duty cycle combinations that will not generate sufficient heat to create damage in eye tissue;
15 and

using the matrix in subsequent handpiece systems to prevent operation of the subsequent handpiece systems outside the matrix of power levels and duty cycle.

20 10. A method for regulating fluid flow and energy in a control console for providing irrigation fluid and energy to an cataract extraction handpiece and aspirating fluid from an eye during ocular surgery, the method comprising the steps of:

25 using a test handpiece to determine a matrix of power levels and duty cycle combinations that will not generate sufficient heat to create damage in eye tissue; and

using the matrix in order to alert a user of subsequent handpiece systems of selected power levels and
30 duty cycles that would cause damage of eye tissue.